IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Sophie Vrzic et al.
Serial No. 10/020,833
Filed: 12/13/2001
For: **PRIORITY SCHEDULER**

Examiner: Meucci, Michael D.
Art Unit: 2142

Mail Stop Appeal Brief – Patents
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Sir:

An **APPEAL BRIEF** is filed herewith. Appellant also encloses a payment in the amount of $500.00 as required by 37 C.F.R. § 1.17(c). If any additional fees are required in association with this appeal brief, the Director is hereby authorized to charge them to Deposit Account 50-1732, and consider this a petition therefor.

APPEAL BRIEF

(1) REAL PARTY IN INTEREST

The real party in interest is the assignee of record, i.e., Nortel Networks Limited of 2351 Boulevard Alfred-Nobel, St. Laurent, Quebec Canada H4S 2A9, which is wholly owned by Nortel Networks Corporation, a Canadian corporation.

(2) RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences to the best of Appellant's knowledge.

(3) STATUS OF CLAIMS

Claims 1-28 were rejected with the rejection made final on April 24, 2006.

Claims 1-28 are pending and are the subject of this appeal.

(4) STATUS OF AMENDMENTS

All amendments have been entered to the best of Appellant's knowledge.

(5) SUMMARY OF CLAIMED SUBJECT MATTER

The present invention provides for a scheduling data for transmission by an access point, such as a base station. The scheduling provides adaptive fairness control, which depends on how close the users are to a minimum data rate requirement. If desired, more emphasis can be placed on fairness when there are users close to the minimum data rate requirement and more emphasis on maximizing throughput when all of the users are far from the required minimum data rate (Specification, paragraphs 0007 and 0030).

In particular, claim 1 recites an access point (such as base station 10, Figure 1) for scheduling delivery of units of data to a plurality of access terminals (such as mobile terminals 12, Figure 1) comprising a network interface (network interface 22, Figure 1) for receiving data from a communication network (communication network 14, Figure 1), a wireless interface (see RF transceiver 24 and antennas 26, Figure 1) for transmitting units of the data to a plurality of access terminals, and a control system (see control system 16, Figure 1) associated with the network interface and the wireless interface. The control system of the invention defined by claim 1 is adapted to store the data received over the communication network as units corresponding to the plurality of access terminals (Specification, paragraph 0016). The control system of the invention defined by claim 1 is also adapted to generate a prioritization factor for each unit of data (Specification, paragraphs 0020 and 0022). The prioritization factor of the invention defined by claim 1 is controlled in proportion to a required data rate associated with each unit of data (see Specification, paragraphs 0022 and 0023), is controlled to maintain a minimum desired data rate associated with each unit of data (see Specification, paragraphs 0022 and 0023), and is controlled to achieve an adaptive fairness objective (see Specification, paragraphs 0022, 0023, 0025, 0026, and 0030). Finally, the control system of the invention defined by claim 1 is adapted to schedule transmission of each unit of data based on the prioritization factor such that more emphasis is placed on fairness when many users are close to the required data rate and more emphasis is placed on maximizing throughput when all users are far from the required data rate (see Specification, paragraphs 0022, 0025, 0026, and 0030).

Independent claim 10 is similar to claim 1, albeit in method format. Claim 10 recites a method for scheduling delivery of units of data to a plurality of access terminals (such as mobile terminals 12, Figure 1). The method of claim 10 comprises the step of storing data received over a communication network as units corresponding to the plurality of access terminals

(Specification, paragraph 0016). The method of claim 10 also comprises the step of generating a prioritization factor for each unit of data (see Specification, paragraphs 0020 and 0022), the prioritization factor being controlled in proportion to a required data rate associated with each unit of data (see Specification, paragraphs 0022 and 0023), to maintain a minimum desired data rate associated with each unit of data (see Specification, paragraphs 0022 and 0023), and to achieve an adaptive fairness objective (see Specification, paragraphs 0022, 0023, 0025, 0026, and 0030). The method of claim 10 also comprises the step of scheduling transmission of each unit of data based on the prioritization factor such that more emphasis is placed on fairness when many users are close to the required data rate and more emphasis is placed on maximizing throughput when all users are far from the required data rate (see Specification, paragraphs 0022, 0025, 0026, and 0030).

Claim 19 is also similar to claim 1, albeit in a computer readable medium format. Claim 19 recites a computer readable medium having software for scheduling transmission of units of data corresponding to a plurality of access terminals (such as mobile terminals 12, Figure 1). The software on the computer readable medium of claim 19 comprises instructions to store data sent from a communication network as units corresponding to the plurality of access terminals (Specification, paragraph 0016). The software on the computer readable medium of claim 19 also comprises instructions to generate a prioritization factor for each unit of data (see Specification, paragraphs 0020 and 0022), the prioritization factor being controlled in proportion to a required data rate associated with each unit of data (see Specification, paragraphs 0022 and 0023), to maintain a minimum desired data rate associated with each unit of data (see Specification, paragraphs 0022 and 0023), and to achieve an adaptive fairness objective (see Specification, paragraphs 0022, 0023, 0025, 0026, and 0030). The software on the computer readable medium of claim 19 also comprises instructions to schedule transmission of each unit of data based on the prioritization factor such that more emphasis is placed on fairness when many users are close to the required data rate and more emphasis is placed on maximizing throughput when all users are far from the required data rate (see Specification, paragraphs 0022, 0025, 0026, and 0030).

Claim 28 is similar to claim 10, but is written in means plus function format. Claim 28 recites a system for scheduling delivery of units of data to a plurality of access terminals (such as mobile terminals 12, Figure 1). The system of claim 28 comprises means for storing data

received over a communication network as units corresponding to the plurality of access terminals (Specification, paragraph 0016). The means for storing data may be the buffer 30 associated with the data plane 20 (see Figure 1 and paragraph 0016), or its equivalent. The system according to claim 28 also comprises means for generating a prioritization factor for each unit of data (see Specification, paragraphs 0020 and 0022), the prioritization factor being controlled in proportion to a required data rate associated with each unit of data (see Specification, paragraphs 0022 and 0023), to maintain a minimum desired data rate associated with each unit of data (see Specification, paragraphs 0022 and 0023), and to achieve an adaptive fairness objective (see Specification, paragraphs 0022, 0023, 0025, 0026, and 0030). The means for generating the prioritization factor may be the control system 16, the control plane 18, and the scheduler 28, or any combination thereof, and any equivalents thereof (see Figure 1; Specification, paragraphs 0022, 0023, 0025, 0026, and 0030). The system of claim 28 also comprises means for scheduling transmission of each unit of data based on the prioritization factor such that more emphasis is placed on fairness when many users are close to the required data rate and more emphasis is placed on maximizing throughput when all users are far from the required data rate (see Specification, paragraphs 0022, 0025, 0026, and 0030). The means for scheduling transmission is the scheduler 28, or its equivalent (Figure 1; Specification, paragraphs 0022, 0025, 0026, and 0030).

(6) GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

A. Whether claims 1, 8, 10, 17, 19, 26, and 28 were properly rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,795,865 B1 to Bahl et al. (hereinafter "Bahl") in view of U.S. Patent No. 6,363,429 B1 to Ketcham (hereinafter "Ketcham") and further in view of U.S. Patent No. 5,935,213 to Rananand et al. (hereinafter "Rananand").

B. Whether claims 2, 11, and 20 were properly rejected under 35 U.S.C. § 103(a) as being unpatentable over Bahl, Ketcham, and Rananand, in view of U.S. Patent No. 6,654,374 B1 to Fawaz et al. (hereinafter "Fawaz") and further in view of U.S. Patent No. 6,049,549 to Ganz et al. (hereinafter "Ganz").

C. Whether claims 3, 12, and 21 were properly rejected under 35 U.S.C. § 103(a) as being unpatentable over Bahl, Ketcham, and Rananand, in view of U.S. Patent Application Publication No. 2004/0136379 A1 to Liao et al. (hereinafter "Liao").

D. Whether claims 4-6, 13-15, and 22-24 were properly rejected under 35 U.S.C. § 103(a) as being unpatentable over Bahl, Ketcham, and Rananand, in view of U.S. Patent No. 6,493,331 B1 to Walton et al. (hereinafter "Walton").

E. Whether claims 7, 16, and 25 were properly rejected under 35 U.S.C. § 103(a) as being unpatentable over Bahl, Ketcham, Rananand, and Walton, in view of U.S. Patent No. 6,421,335 B1 to Kilkki et al. (hereinafter "Kilkki").

F. Whether claims 9, 18, and 27 were properly rejected under 35 U.S.C. § 103(a) as being unpatentable over Bahl, Ketcham, and Rananand, in view of Fawaz and Walton.

(7) ARGUMENT

A. Introduction

Claims 1, 10, 19, and 28 all recite that the data units are scheduled for transmission based on a prioritization factor such that *more emphasis is placed on fairness when many users are close to the required data rate and more emphasis is placed on maximizing throughput when all users are far from the required data rate.* The cited references fail to teach or suggest at least this limitation. Since the cited references do not teach or suggest each and every limitation of the claim, the Patent Office has failed to show a *prima facie* case of obviousness. The dependent claims further define the patentable subject matter of independent claims 1, 10, and 19, respectively. As such, the dependent claims also define patentable subject matter. Accordingly, Appellant respectfully submits that the rejections are improper and should be withdrawn, and requests that the Board instruct the Patent Office to allow the pending claims.

B. Summary of the References

1. U.S. Patent No. 6,795,865 B1 to Bahl

Bahl is directed to a method for adaptively changing weights for fair scheduling for data transmission in broadcast environments. The method allocates bandwidth among a plurality of flows, such as nodes, sharing an output link, such as a network. The method includes adaptively determining a weight for each flow based on a predetermined criterion and allocating a portion of bandwidth to each flow proportionally to the weight of the flow. The predetermined criterion takes into account either an input rate of data packets for each flow, or a queue size for each flow (Bahl, Abstract).

2. U.S. Patent No. 6,363,429 B1 to Ketcham

Ketcham is directed to a method and system for automatic determination of priority data streams on a computer network that can be used for quality of service and other purposes (Ketcham, col. 1, lines 6-10). A data traffic signature is calculated for a data stream using various criteria. A calculated data traffic signature is checked to see if it matches a known data traffic signature for a known type of data stream (Ketchum, Abstract). If there is a match, resources are allocated on a network device to provide a desired processing priority to data packets in the data stream. Data packets in a higher priority stream associated with a calculated data traffic signature are sent and received before any data packets from data streams with a lower processing priority (Ketchum, Abstract).

3. U.S. Patent No. 5,935,213 to Rananand

Rananand relates to a digital network in which message transfer paths may be provided with various classes of transfer service, including an unregulated available bit rate service. A mechanism is provided for allowing the network to control the rate at which devices transmit messages over the network based on congestion along the path between source devices and destination devices (Rananand, col. 1, lines 9-16). A switching node includes a buffer for buffering cells transmitted in the downstream direction, a cell receiver for receiving cells from the network and buffering the received cells in the buffer, and a cell transmitter for transmitting cells in the buffer (Rananand, Abstract). A resource management cell information generator generates the flow control information for inclusion in resource management cells to be transmitted. A maximum allowed rate value is periodically generated in response to a buffer occupancy rate identifying the current portion of the buffering currently buffering cells for transmission (Rananand, Abstract).

4. U.S. Patent No. 6,654,374 B1 to Fawaz

Fawaz is directed to a method to reduce jitter in packet switched networks (Fawaz, Title). A packet network provides a guaranteed minimum bandwidth between pairs of packet switches by defining Service Level Agreements (SLAs) (Fawaz, Abstract). An SLA is defined by at least a source identifier, a destination identifier, and a minimum data rate (Fawaz, Abstract). Upon

arrival at certain networked nodes, packets are classified according to an SLA by reading the source and destination addresses and are placed in a queue and scheduled for transmission. A scheduler ensures that packets are transmitted at the minimum data rate for that SLA (Fawaz, Abstract). The scheduler may use a statistical multiplexing method, such as deficit round robin, or deficit golden ratio, which assures a minimum rate to packets for a particular SLA, but minimizes jitter and delay (Fawaz, Abstract).

5. U.S. Patent No. 6,049,549 to Ganz

Ganz relates to adaptive media control in a communication network that supports transmission of data streams with QoS requirements, such as minimum throughput or maximum delay, while adapting to the changing characteristics of the transmission medium (Ganz, Abstract). The media control approach uses a polling manager, which uses an efficient "just in time" polling of stations based on their allocated bandwidth or communication rates, and a resource manager, which provides an admission control procedure that prevents admission of sessions that cannot be supported by the system and allocates network resources needed to support admitted sessions (Ganz, Abstract). Stations that do not use their allocated rates are polled less often that those which use their allocation, thereby increasing the total throughput and provide proper QoS support (Ganz, Abstract).

6. U.S. Patent Application Publication No. 2004/0136379 A1 to Liao

Liao relates to a method for allocating limited network resources, such as bandwidth and buffer memory (Liao, Abstract). Scheduler software adjusts the service weights associated with various data categories in order to regulate packet loss and delay. Central control software monitors network traffic conditions and regulates traffic at selected ingresses in order to reduce congestion (Liao, Abstract). A method of calculating data utility functions enables utility maximization and/or fairness of resource allocation (Liao, Abstract).

7. U.S. Patent No. 6,493,331 B1 to Walton

Walton relates to a system in which each cell in the system can be designed to operate in accordance with a set of back-off factors that identify the reductions in peak transmit power levels for the channels associated with the back-off factors (Walton, Abstract). The back-off

factors are defined to provide the required power to a large percentage of the users while reducing the amount of interference (Walton, Abstract). The cells may also use an adaptive reuse scheme whereby changes in the operating conditions of the system are detected and the reuse scheme is redefined based on the changes (Walton, Abstract). In addition, data transmissions can be scheduled based on user priorities, some fairness criteria, system requirements, and other factors (Walton, Abstract).

8. U.S. Patent No. 6,421,335 B1 to Kilkki

Kilkki is directed to a system for integrating a priority-based quality of service in CDMA communications systems that implement data packet transmission in order to effectively allocate radio resources (Kilkki, Abstract). A nominal bit rate is established for each user desiring access to the CDMA interface. A relative packet priority is calculated for each data packet based on actual bit rate at the source of the CDMA interface and the established nominal bit rate (Kilkki, Abstract). An allowable packet priority is calculated for the CDMA interface based on a signal-to-noise ratio of the CDMA interface, and the data packets having a relative packet priority greater than or equal to the allowable packet priority are transmitted across the CDMA interface (Kilkki, Abstract).

C. Legal Standards for Establishing Obviousness

Section 103(a) of the Patent Act provides the statutory basis for an obviousness rejection and reads as follows:

> A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Courts have interpreted 35 U.S.C. § 103(a) as a question of law based on underlying facts. As the Federal Circuit stated:

> Obviousness is ultimately a determination of law based on underlying determinations of fact. These underlying factual determinations include: (1) the scope and content of the prior art; (2) the level of ordinary skill in the art; (3) the differences between the claimed invention and the prior art; and (4) the extent of any proffered objective indicia of nonobviousness.

Monarch Knitting Mach. Corp. v. Sulzer Morat GmBH, 45 U.S.P.Q.2d (BNA) 1977, 1981 (Fed. Cir. 1998) (internal citations omitted).

Once the scope of the prior art is ascertained, the content of the prior art must be properly combined. Initially, the Patent Office must show that there is a suggestion to combine the references. *In re Dembiczak*, 175 F.3d 994 (Fed. Cir. 1999). Even if the Patent Office is able to articulate and support a suggestion to combine the references, it is impermissible to pick and choose elements from the prior art while using the application as a template. *In re Fine*, 837 F.3d 1071 (Fed. Cir. 1988). To reconstruct the invention by such selective extraction constitutes impermissible hindsight. *In re Gorman*, 933 F.2d 982 (Fed. Cir. 1991). After the combination has been made, for a *prima facie* case of obviousness, the combination must still teach or fairly suggest all of the claim elements. *In re Royka*, 490 F.2d 981 (C.C.P.A. 1974); MPEP § 2143.03.

Some elements may be inherent within the reference. "To establish inherency, the extrinsic evidence 'must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill.'" *In re Robertson*, 169 F.3d 743, 745 (Fed. Cir. 1999) (quoting *Cont'l Can Co. v. Monsanto Co.*, 948 F.2d 1264, 1268 (Fed. Cir. 1991)). "The mere fact that a certain thing may result from a given set of circumstances is not sufficient." *Id.* (citation and quotation omitted). Thus, the possibility that an element may be derived from the reference is insufficient to establish that said element is inherent to the reference.

Whether an element is implicitly or explicitly taught by a reference or combination of references is open to interpretation. While the Patent Office is entitled to give claim terms their broadest reasonable interpretation, this interpretation is limited by a number of factors. First, the interpretation must be consistent with the specification. *In re Hyatt*, 211 F.3d 1367, 1372 (Fed. Cir. 2000); MPEP § 2111. Second, the broadest reasonable interpretation of the claims must also be consistent with the interpretation that those skilled in the art would reach. *In re Cortright*, 165 F.3d 1353, 1359, (Fed. Cir. 1999); MPEP § 2111. Finally, the interpretation must be reasonable. *In re Am. Acad. of Sci. Tech Ctr.*, 367 F.3d 1359, 1369 (Fed. Cir. 2004); MPEP § 2111.01. This means that the words of the claim must be given their plain meaning unless Appellant has provided a clear definition in the specification. *In re Zletz*, 893 F.2d 319, 321 (Fed. Cir. 1989).

If a claim element is missing after the combination is made, then the combination does not render obvious the claimed invention, and the claims are allowable. As stated by the Federal Circuit, "[if] the PTO fails to meet this burden, then the Appellant is entitled to the patent." *In re Glaug*, 283 F.3d 1335, 1338 (Fed. Cir. 2002).

D. Claims 1, 8, 10, 17, 19, 26, and 28 Are Not Obvious

Claims 1, 10, 19, and 28 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Bahl in view of Ketcham and Rananand. For the Patent Office to combine references in an obviousness rejection the Patent Office must do two things. First, the Patent Office must state a motivation to combine the references, and second, the Patent Office must support the stated motivation with actual evidence. *In re Dembiczak*, 175 F.3d 994, 999 (Fed. Cir. 1999). Once a proper combination is made, to establish *prima facie* obviousness, the Patent Office must show where each and every element is taught or suggested. MPEP § 2143.03.

Claims 1, 10, 19, and 28 all recite that the data units are scheduled for transmission based on a prioritization factor such that *more emphasis is placed on fairness when many users are close to the required data rate and more emphasis is placed on maximizing throughput when all users are far from the required data rate.* The cited references fail to teach or suggest at least this limitation. The Patent Office has stated that Bahl and Ketcham fail to disclose a scheduling technique where *more emphasis is placed on fairness when many users are close to the required data rate and more emphasis is placed on maximizing throughput when all users are far from the required data rate*, but instead relies on Rananand to teach this limitation (Final Office Action mailed April 24, 2006, p. 5). In particular the Patent Office states that the following passage discloses this limitation:

> This service rate may differ as among the various connections, although for various ones of the connections being serviced by a switching node 11(*n*) the service rate guarantees may be similar or identical. *Other connections may be provided with a minimum service rate, in which case they will be ensured at least a specified minimum rate, but may be transferred faster when there is available transfer bandwidth above that required for the connections for which there is a service rate guarantee.*
>
> Rananand, col. 4, line 65 through col. 5, line 7, emphasis added.

Appellant has reviewed the above cited passage and respectfully submits that it merely indicates that higher transfer rates are used when there is available bandwidth for connections, which are

associated with a specified minimum rate. As such, anytime there is extra bandwidth the transfer rates may be increased for certain connections. This passage only relates to increasing throughput in general.

The limitation at issue has two primary parts where each part has one sub-part. The Patent Office has failed to show where each of the parts and the corresponding sub-parts are found in Rananand. One part is to a) maximize throughput b) *when all users are far from the required data rate.* Rananand does not increase data rate, let alone attempt to maximize throughput, *when all users are far from the required data rate.* As such, this part of the limitation is not taught or suggested.

The other part of the limitation is to a) place more emphasis on fairness b) *when many users are close to the required data rate.* Rananand does not teach or suggest emphasizing fairness, let alone emphasizing fairness *when many users are close to the required data rate.* In summary, the cited references simply do not teach or suggest increasing transfer rates when extra bandwidth is available to show each of the following:

- placing more emphasis on fairness
- when many users are close to the required data rate, and
- placing more emphasis on maximizing throughput
- when all users are far from the required data rate.

The Patent Office has the burden of showing where each of these four aspects are taught or suggested in Rananand. The Patent Office has failed to carry this burden.

The present invention is directed to a method and system of scheduling transmission of data to achieve an adaptive fairness objective where the transmission is scheduled such that more emphasis is placed on fairness when many users are close to the required data rate and more emphasis is placed on maximizing throughput when all users are far from the required data rate. (Claim 1; Specification, paragraph 0019). Applicant refers to paragraphs 0023-0025 of the Specification to illustrate how one embodiment of the invention accomplishes the adaptive fairness objective where the transmission is scheduled such that more emphasis is placed on fairness when many users are close to the required data rate and more emphasis is placed on maximizing throughput when all users are far from the required data rate. This embodiment is merely one example of the current invention and the claims are not limited to this embodiment. In general, the scheduler assigns a priority to each unit of data in the queue, the priority having a

throughput and fairness variable and a delay variable (Specification, paragraph 0022). The throughput and fairness component has two components; the first component maximizes throughput by giving a higher priority to a user with a higher selected data rate, while the second component guarantees the minimum throughput and controls the degree of fairness by comparing the average throughput to the minimum required throughput (Specification, paragraph 0023). The throughput and fairness component has a variable a, which varies depending on how close the users are to their respective required minimum throughput rate (Specification, paragraph 0024). Thus, the fairness and throughput component of the priority factor has the following properties: as a increases (i.e., users are far away from the required data rate), then throughput is increased (i.e., more emphasis is placed on throughput); and as a decreases (i.e., the users are close to the required data rate), the degree of fairness increases (i.e., more emphasis is placed on fairness) (Specification, paragraph 0025). As a approaches 1 (i.e., all the users are far from the required data rate), then the scheduler is equivalent to a maximum C/I scheduler, where the channel with the best channel conditions would get the highest priority (Specification, paragraph 0025).

In contrast, the prior art of Rananand does not emphasize fairness when many users are close to the required data rate and emphasize throughput when the users are far from the required data rate. Rananand simply teaches that when there is extra bandwidth, the throughput may be increased. (Rananand, col. 4, line 54 through col. 5, line 7). Under the example above, if the users are close to the required data rate, but there was available bandwidth, then the throughput would still be increased. Obviously, this would not meet the claim requirement that more emphasis be placed on fairness in this situation. As can be seen from this example, Rananand does not teach the situation where *"more emphasis is placed on fairness when many users are close to the required data rate and more emphasis is placed on maximizing throughput when all users are far from the required data rate,"* as is required by the present invention.

In the Final Office Action mailed April 24, 2006, the Patent Office asserts that the terms "more emphasis," "many users," and "far from the required data rate" are relative terms and are broadly construed. As such, the Patent Office argues that the "mere fact that higher transfer rates are used when bandwidth is available proves that emphasis is placed on maximizing throughput when users are not below threshold values." (Final Office Action mailed April 24, 2006, pp. 19-20). Appellant notes that while the Patent Office is entitled to give claim terms their broadest

reasonable interpretation, this interpretation is limited by a number of factors. First, the interpretation must be consistent with the specification. *In re Hyatt*, 211 F.3d 1367, 1372 (Fed. Cir. 2000); MPEP § 2111. Second, the broadest reasonable interpretation of the claims must also be consistent with the interpretation that those skilled in the art would reach. *In re Cortright*, 165 F.3d 1353, 1359, (Fed. Cir. 1999); MPEP § 2111. Finally, the interpretation must be reasonable. *In re American Academy of Science Tech Center*, 367 F.3d 1359, 1369 (Fed. Cir. 2004); MPEP § 2111.01. Appellant respectfully submits that even under a broad interpretation, the terms "more emphasis," "many users," and "far from the required data rate" must be given some weight and cannot be ignored, as the Patent Office seemingly wants to do.[1] Appellant respectfully submits that under the broadest reasonable interpretation consistent with the Specification that a person of ordinary skill in the art would reach, Rananand does not teach or suggest each and every limitation of the claimed invention. In particular, Rananand fails to teach or suggest scheduling the data units for transmission based on a prioritization factor such that *more emphasis is placed on fairness when many users are close to the required data rate and more emphasis is placed on maximizing throughput when all users are far from the required data rate*, as required by the present invention.

First, contrary to the Patent Office's assertion, the mere fact that higher transfer rates are used when bandwidth is available does not necessarily prove that emphasis is placed on maximizing throughput when users are not below threshold values[2]. Even if it did prove that emphasis is placed on maximizing throughput when users are not below threshold values, as asserted by the Patent Office, the present invention claims something different. Claims 1, 10, 19, and 28 all recite that ***more** emphasis is placed on maximizing throughput **when all users are far from the required data rate**.* In contrast, Rananand does not teach or suggest placing ***more*** emphasis on maximizing throughput ***when all users are far from the required data rate*** than when all users are not far from the required data rate. In fact, Rananand does not even teach or suggest anything about whether all users are far from the required data rate or what to do if all users are far from the required data rate. Thus, Rananand does not teach or suggest that *more emphasis is placed on maximizing throughput when all users are far from the required data rate*,

[1] In particular, the Patent Office's analysis seemingly ignores the words "more" and "many" and "when all users are far from the required data rate." (see Final Office Action mailed April 24, 2006, pp. 19-20.)

[2] Notably, the Patent Office does not assert that Rananand shows that more emphasis is placed on maximizing throughput when all users are far from the required data rate. The Patent Office is improperly trying to read "more" out of the claim.

as required by the claims. Since Rananand does not teach the limitation for which it is cited, and the Patent Office has admitted this element is not taught by Bahl and/or Ketcham, the combination of Bahl, Ketcham, and Rananand does not collectively teach or suggest each and every element of independent claims 1, 10, 19, and 28, and *prima facie* obviousness has not been established.

In addition, Rananand does not teach or suggest scheduling the data units for transmission based on a prioritization factor such that *more emphasis is placed on fairness when many users are close to the required data rate*. For the first time, the Patent Office in the Final Office Action points to col. 18, lines 7-19 of Rananand as teaching the claim limitations (Final Office Action mailed April 24, 2006, p. 20). The cited passage reads:

> Generally, if the buffer occupancy rate is relatively high, in determining an explicit rate value for field 45 of an RM cell that is associated with a particular connection, among a number of connections serviced by the particular output port module 61(*p*), the RM cell information generator 85 will consider the resources which are devoted to the particular connection, which, in turn, so as to permit generally equal sharing of the resources among all of the connections serviced by the output port module 61(*p*). This, in turn, is generally related to the portion of the buffer 82, in particular the portion devoted to the available bit rate service, which is occupied by cells for the particular connection.

The Patent Office asserts that the cited portion of Rananand shows "equal sharing of the resources among all of the connections" when "buffer occupancy is relatively high," and that this shows that emphasis is placed on fairness when many users are close to the required data rate (Final Office Action mailed April 24, 2006, p. 20)[3]. Appellant respectfully disagrees. "Equal sharing of the resources among all of the connections" is not equivalent to "***more** emphasis is placed on fairness when many users are close to the required data rate*," as required by the claimed invention. Moreover, the fact that the "buffer occupancy is relatively high" is not the same as the claimed "*when many users are close to the required data rate*." The occupancy of the buffer does not relate to whether many users are close to the required data rate. Accordingly, this newly cited portion of Rananand does not teach or suggest scheduling the data units for transmission based on a prioritization factor such that *more emphasis is placed on fairness when many users are close to the required data rate*, as required by the independent claims of the

[3] Once again, the Patent Office does not assert that Rananand shows "more" emphasis is placed on fairness when "many" users are close to the required data rate. The Patent Office is impermissibly trying to read "more" and "many" out of the claim.

present invention. Since Rananand does not teach the limitation for which it is cited, and the Patent Office has admitted this element is not taught by Bahl and/or Ketcham, the combination of Bahl, Ketcham, and Rananand does not collectively teach or suggest each and every element of independent claims 1, 10, 19, and 28, and *prima facie* obviousness has not been established. As such, claims 1, 10, 19, and 28 define patentable subject matter.

Claims 8, 17, and 26 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Bahl, Ketcham, and Rananand as applied to claims 1, 10, and 19, respectively. As set forth above, the combination of Bahl, Ketcham, and Rananand does not teach each and every limitation of claims 1, 10, 19, and 28. Claims 8, 17, and 26 further define the patentable subject matter of independent claims 1, 10, and 19, respectively. As such, claims 8, 17, and 26 also define patentable subject matter.

E. Claims 2, 11, and 20 Are Not Obvious

Claims 2, 11, and 20 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Bahl, Ketcham, and Rananand as applied to claims 1, 10, and 19, respectively, and further in view of Fawaz et al. (hereinafter "Fawaz") and Ganz et al. (hereinafter "Ganz"). As set forth above, the combination of Bahl, Ketcham, and Rananand does not teach each and every limitation of claims 1, 10, 19, and 28. Claims 2, 11, and 20 further define the patentable subject matter of independent claims 1, 10, and 19, respectively. Further, Fawaz and Ganz fail to cure the deficiencies of the combination of Bahl, Ketcham, and Rananand. As such, claims 2, 11, and 20 also define patentable subject matter.

F. Claims 3, 12, and 21 Are Not Obvious

Claims 3, 12, and 21 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Bahl, Ketcham, and Rananand as applied to claims 1, 10, and 19, respectively, and further in view of Liao et al. (hereinafter "Liao"). As set forth above, the combination of Bahl, Ketcham, and Rananand does not teach each and every limitation of claims 1, 10, 19, and 28. Claims 3, 12, and 21 further define the patentable subject matter of independent claims 1, 10, and 19, respectively. Further, Liao fails to cure the deficiencies of the combination of Bahl, Ketcham, and Rananand. As such, claims 3, 12, and 21 also define patentable subject matter.

G. Claims 4-6, 13-15, and 22-24 Are Not Obvious

Claims 4, 5, 13, 14, 22, and 23 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Bahl, Ketcham, and Rananand as applied to claims 1, 10, and 19, respectively, and further in view of Walton et al. (hereinafter "Walton"). As set forth above, the combination of Bahl, Ketcham, and Rananand does not teach each and every limitation of claims 1, 10, 19, and 28. Claims 4, 5, 13, 14, 22, and 23 further define the patentable subject matter of independent claims 1, 10, and 19, respectively. Further, Walton fails to cure the deficiencies of the combination of Bahl, Ketcham, and Rananand. As such, claims 4, 5, 13, 14, 22, and 23 also define patentable subject matter.

Claims 6, 15, and 24 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Bahl, Ketcham, Rananand, and Walton as applied to claims 5, 14, and 23, respectively. As set forth above, the combination of Bahl, Ketcham, and Rananand does not teach each and every

limitation of claims 1, 10, 19, and 28. Claims 6, 15, and 24 further define the patentable subject matter of independent claims 1, 10, and 19, respectively. As noted, Walton fails to cure the deficiencies of the combination of Bahl, Ketcham, and Rananand. As such, claims 6, 15, and 24 also define patentable subject matter.

H. Claims 7, 16, and 25 Are Not Obvious

Claims 7, 16, and 25 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Bahl, Ketcham, Rananand, and Walton as applied to claims 5, 14, and 23, respectively, and further in view of Kilkki et al. (hereinafter "Kilkki"). As set forth above, the combination of Bahl, Ketcham, and Rananand does not teach each and every limitation of claims 1, 10, 19, and 28. Claims 7, 16, and 25 further define the patentable subject matter of independent claims 1, 10, and 19, respectively. Further, Walton and Kilkki fail to cure the deficiencies of the combination of Bahl, Ketcham, and Rananand. As such, claims 7, 16, and 25 also define patentable subject matter.

I. Claims 9, 18, and 27 Are Not Obvious

Claims 9, 18, and 27 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Bahl, Ketcham, and Rananand as applied to claims 1, 10, and 27, respectively, and further in view of Fawaz and Walton. As set forth above, the combination of Bahl, Ketcham, and Rananand does not teach each and every limitation of claims 1, 10, 19, and 28. Claims 9, 18, and 27 further define the patentable subject matter of independent claims 1, 10, and 19, respectively. As previously noted, Fawaz and Walton fail to cure the deficiencies of the combination of Bahl, Ketcham, and Rananand. As such, claims 9, 18, and 27 also define patentable subject matter.

J. Conclusion

The cited references fail to teach or suggest each and every limitation of the claimed invention. The independent claims 1, 10, 19, and 28 all recite that the data units are scheduled for transmission based on a prioritization factor such that *more emphasis is placed on fairness when many users are close to the required data rate and more emphasis is placed on maximizing throughput when all users are far from the required data rate.* Rananand and the other cited

references fail to teach or suggest this limitation. Since the cited references do not teach or suggest each and every limitation of the claims, the Patent Office has failed to show a *prima facie* case of obviousness. The dependent claims further define the patentable subject matter of independent claims 1, 10, and 19, respectively. As such, the dependent claims also define patentable subject matter. Accordingly, Appellant respectfully submits that the rejections are improper and should be withdrawn, and requests that the Board instruct the Patent Office to allow the pending claims.

Respectfully submitted,
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(8) APPENDIX

1. An access point for scheduling delivery of units of data to a plurality of access terminals comprising:

a. a network interface for receiving data from a communication network;

b. a wireless interface for transmitting units of the data to a plurality of access terminals; and

c. a control system associated with the network interface and the wireless interface and adapted to:

i. store the data received over the communication network as units corresponding to the plurality of access terminals;

ii. generate a prioritization factor for each unit of data, the prioritization factor being controlled:

A. in proportion to a required data rate associated with each unit of data,

B. to maintain a minimum desired data rate associated with each unit of data, and

C. to achieve an adaptive fairness objective; and

iii. schedule transmission of each unit of data based on the prioritization factor such that more emphasis is placed on fairness when many users are close to the required data rate and more emphasis is placed on maximizing throughput when all users are far from the required data rate.

2. The access point of claim 1 wherein the adaptive fairness objective functions to adaptively increase the prioritization factor as an average data rate associated with each unit of data approaches the minimum desired data rate associated with each unit of data.

3. The access point of claim 1 wherein when there are insufficient resources to maintain the minimum desired data rate associated with each unit of data, the control system is further adapted to control the prioritization factor for each unit of data to reduce the variance in data rates associated with the units of data between different users.

4. The access point of claim 1 wherein the adaptive fairness objective is configurable to make overall throughput of the units of data inversely proportional to fairness between different users.

5. The access point of claim 1 wherein select ones of the units of data are time-sensitive and associated with a delay bound and the control system is further adapted to control the prioritization factor for each time-sensitive unit of data in inverse proportion to an amount of time prior to the delay bound associated with each time-sensitive unit of data wherein the time-sensitive units of data are given higher priorities as the delay bounds approach.

6. The access point of claim 5 wherein each time-sensitive unit of data is associated with a start time, which represents a threshold when the prioritization factor for the unit of data is adjusted based on the delay bound.

7. The access point of claim 5 wherein the control system is further adapted to adjust the prioritization factor for each time-sensitive unit of data to control the maximum percentage of the units of data that can be dropped prior to transmission.

8. The access point of claim 1 wherein a plurality of carriers are available to transmit the units of data and the control system is further adapted to generate the prioritization factor for each unit of data for each of the plurality of carriers and schedule the transmission of each unit of data on at least one of the plurality of carriers based on the prioritization factor.

9. The access point of claim 1 wherein:

a. the adaptive fairness objective functions to adaptively increase the prioritization factor as an average data rate associated with each unit of data approaches the minimum desired data rate associated with each unit of data; and

b. select ones of the units of data are time-sensitive and associated with a delay bound and the control system is further adapted to control the prioritization factor for each time-sensitive unit of data in inverse proportion to an amount of time prior to the delay bound

associated with each time-sensitive unit of data wherein the time-sensitive units of data are given higher priorities as the delay bounds approach.

10. A method for scheduling delivery of units of data to a plurality of access terminals comprising:

a. storing data received over a communication network as units corresponding to the plurality of access terminals;

b. generating a prioritization factor for each unit of data, the prioritization factor being controlled:

i. in proportion to a required data rate associated with each unit of data,

ii. to maintain a minimum desired data rate associated with each unit of data, and

iii. to achieve an adaptive fairness objective; and

c. scheduling transmission of each unit of data based on the prioritization factor such that more emphasis is placed on fairness when many users are close to the required data rate and more emphasis is placed on maximizing throughput when all users are far from the required data rate.

11. The method of claim 10 wherein the adaptive fairness objective functions to adaptively increase the prioritization factor as an average data rate associated with each unit of data approaches the minimum desired data rate associated with each unit of data.

12. The method of claim 10 wherein when there are insufficient resources to maintain the minimum desired data rate associated with each unit of data, the method further comprises controlling the prioritization factor for each unit of data to reduce variance in data rates associated with the units of data between different users.

13. The method of claim 10 wherein the adaptive fairness objective is configurable to make overall throughput of the units of data inversely proportional to fairness between different users.

14. The method of claim 10 wherein select ones of the units of data are time-sensitive and associated with a delay bound and the method further comprises controlling the prioritization factor for each time-sensitive unit of data in inverse proportion to an amount of time prior to the delay bound associated with each time-sensitive unit of data wherein the time-sensitive units of data are given higher priorities as the delay bounds approach.

15. The method of claim 14 wherein each time-sensitive unit of data is associated with a start time, which represents a threshold when the prioritization factor for the unit of data is adjusted based on the delay bound.

16. The method of claim 14 further comprising adjusting the prioritization factor for each time-sensitive unit of data to control the maximum percentage of the units of data that can be dropped prior to transmission.

17. The method of claim 10 wherein a plurality of carriers are available to transmit the units of data, the prioritization factor is generated for each unit of data for each of the plurality of carriers and the transmission of each unit of data is scheduled on at least one of the plurality of carriers based on the prioritization factor.

18. The method of claim 10 wherein:

a. the adaptive fairness objective functions to adaptively increase the prioritization factor as an average data rate associated with each unit of data approaches the minimum desired data rate associated with each unit of data; and

b. select ones of the units of data are time-sensitive and associated with a delay bound and the method further comprises controlling the prioritization factor for each time-sensitive unit of data in inverse proportion to an amount of time prior to the delay bound associated with each time-sensitive unit of data wherein the time-sensitive units of data are given higher priorities as the delay bounds approach.

19. A computer readable medium having software for scheduling transmission of units of data corresponding to a plurality of access terminals, the software comprising instructions to:

a. store data sent from a communication network as units corresponding to the plurality of access terminals;

b. generate a prioritization factor for each unit of data, the prioritization factor being controlled:

i. in proportion to a required data rate associated with each unit of data,

ii. to maintain a minimum desired data rate associated with each unit of data, and

iii. to achieve an adaptive fairness objective; and

c. schedule transmission of each unit of data based on the prioritization factor such that more emphasis is placed on fairness when many users are close to the required data rate and more emphasis is placed on maximizing throughput when all users are far from the required data rate.

20. The computer readable medium of claim 19 wherein the adaptive fairness objective functions to adaptively increase the prioritization factor as an average data rate associated with each unit of data approaches the minimum desired data rate associated with each unit of data.

21. The computer readable medium of claim 19 wherein when there are insufficient resources to maintain the minimum desired data rate associated with each unit of data, the instructions are further adapted to control the prioritization factor for each unit of data to reduce variance in data rates associated with the units of data between different users.

22. The computer readable medium of claim 19 wherein the adaptive fairness objective is configurable to make overall throughput of the units of data inversely proportional to fairness between different users.

23. The computer readable medium of claim 19 wherein select ones of the units of data are time-sensitive and associated with a delay bound and the instructions are further adapted to control the prioritization factor for each time-sensitive unit of data in inverse proportion to an amount of time prior to the delay bound associated with each time-sensitive unit of data wherein the time-sensitive units of data are given higher priorities as the delay bounds approach.

24. The computer readable medium of claim 23 wherein each time-sensitive unit of data is associated with a start time, which represents a threshold when the prioritization factor for the unit of data is adjusted based on the delay bound.

25. The computer readable medium of claim 23 wherein the instructions are further adapted to adjust the prioritization factor for each time-sensitive unit of data to control a maximum percentage of the units of data that can be dropped prior to transmission.

26. The computer readable medium of claim 19 wherein a plurality of carriers are available to transmit the units of data and the instructions are further adapted to generate the prioritization factor for each unit of data for each of the plurality of carriers and schedule the transmission of each unit of data on at least one of the plurality of carriers based on the prioritization factor.

27. The computer readable medium of claim 19 wherein:

a. the adaptive fairness objective functions to adaptively increase the prioritization factor as an average data rate associated with each unit of data approaches the minimum desired data rate associated with each unit of data; and

b. select ones of the units of data are time-sensitive and associated with a delay bound and the instructions are further adapted to control the prioritization factor for each time-sensitive unit of data in inverse proportion to an amount of time prior to the delay bound associated with each time-sensitive unit of data wherein the time-sensitive units of data are given higher priorities as the delay bounds approach.

28. A system for scheduling delivery of units of data to a plurality of access terminals comprising:

a. means for storing data received over a communication network as units corresponding to the plurality of access terminals;

b. means for generating a prioritization factor for each unit of data, the prioritization factor being controlled:

i. in proportion to a required data rate associated with each unit of data,

ii. to maintain a minimum desired data rate associated with each unit of data, and

iii. to achieve an adaptive fairness objective; and

c. means for scheduling transmission of each unit of data based on the prioritization factor such that more emphasis is placed on fairness when many users are close to the required data rate and more emphasis is placed on maximizing throughput when all users are far from the required data rate.

(9) EVIDENCE APPENDIX

Appellant relies on no evidence, thus this appendix is not applicable.

(10) RELATED PROCEEDINGS APPENDIX

As there are no related proceedings, this appendix is not applicable.